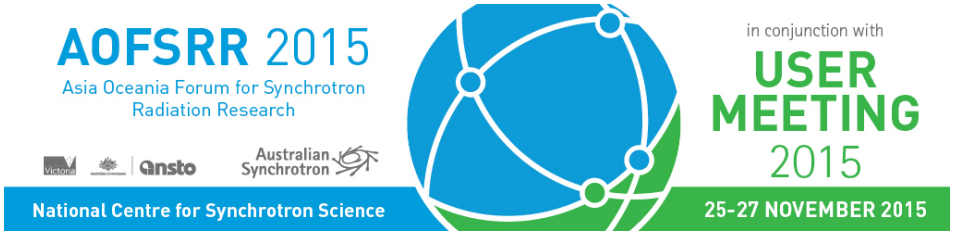

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Cu_{5-x}Mn_xSbO₆ Raman and Infrared Spectroscopy Investigations

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The large crystallographic and chemical diversity of copper-based metal oxides is one of their highlighting features and cause for pursuit into copper based material research. An interesting feature seen in copper based metal oxides is the coexistence of different copper oxidation states in different crystallographic positions. This can lead to a mixture of magnetically active Cu2+ and magnetically inactive Cu1+ within the same compound, with different structural motifs. One interesting compound that demonstrates this coexistence of mixed copper oxidation states is Cu5-xMnxSbO6 which crystallises in a modified Delafossite structure type (CuFeO2). Here, the magnetically active brucite-like CuO2 layer was diluted in an ordered fashion with non-magnetic Sb5+. These layers were separated by linearly coordinated, magnetically inactive Cu1+, with two modifications, which depended on the stacking of the layers being ordered or disordered. Additionally, manganese was used as a dopant in order to replace the copper in the octahedral layers.

Previous investigations with solid-state Raman spectroscopy showed a reversible pressure-induced phase transition at room temperature for the ordered modification. This was not observed for the disordered modification. With synchrotron X-ray powder diffraction there was an observed increase in the reflections, attributed to the disordered modification in the ordered modification's diffraction pattern, when substituting manganese into the structure. Therefore, we investigated the nature of this phase transition with Raman and infrared spectroscopy, and how the effect manganese has on the two modifications influences this phase transition.

Keywords

Raman spectroscopy, infrared spectroscopy, copper antimony oxide, phase transition

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